Contents

Conference Chairperson's preface xii
Editors' preface xiv

SECTION I. PLENARY PAPERS

Fundamental aspects of vapor growth and epitaxy *
G.B. Stringfellow 1
Molecular layer epitaxy and its fundaments *
J. Nishizawa 12

SECTION II. SPECIAL GUEST PAPERS

Problems in epitaxial growth of high-T_c superconductors *
H.J. Scheel, M. Berkowski and B. Chabot 19
Comparison of thin films of $YBa_2Cu_3O_{7-x}$ deposited by physical (laser ablation) and chemical (OMCVD) methods for device applications *
M. Schieber, S.C. Han, Y. Ariel, S. Chokron, T. Tsach, M. Maharizi, C. Deutscher, D. Racah, A. Raizman and S. Rotter 31
Vapour growth of bulk anisotropic crystals; case study of α-HgI_2 *
M. Zha, M. Piechotka and E. Kaldis 43

SECTION III. SELECTIVE AND FRACTIONAL EPITAXY, AND ATOMIC LAYER EPITAXY

The use of chloride based precursors in metalorganic vapor phase epitaxy *
T.F. Kuech 52
Step-flow growth and fractional-layer superlattices on GaAs vicinal surfaces by MOCVD *
T. Fukui and H. Saito 61
Selective embedded growth of GaAs by MOVPE
C. Anayama, T. Tanahashi and K. Nakajima 65
Selective epitaxy of GaAs/AlGaAs on (111)B substrates by MOCVD and applications to nanometer structures
S. Ando, S.S. Chang and T. Fukui 69
In-situ selective-area epitaxy of a GaAs-based heterostructure using a GaAs oxide layer as a mask
Y. Hiratani, Y. Ohki and M. Sasaki 74
Atomic layer epitaxy of germanium on silicon using flash heating chemical vapor deposition
M. Sakuraba, J. Murota, N. Mikoshiba and S. Ono 79
Surface adsorption and carbon incorporation in ALE GaAs growth process
Li-Qiang Liu, Bai-Biao Huang, Hong-Wen Ren and Min-Hua Jiang 83
Atomic layer epitaxy of GaAs using N_2 carrier gas
H. Yokoyama, M. Shinohara and N. Inoue 89
Temperature programmed desorption study of gallium chloride adsorbed on GaAs surfaces
C. Sasaoka, Y. Kato and A. Usui 94

SECTION IV. HETEROEPITAXY (SiGe/Si, III–V/Si, and III–V/III–V)

Synthesis and structural configuration of highly strained InAs films in GaAs *
O. Brandt, K. Ploog, L. Tapfer, M. Hohenstein and F. Phillipp 99

* Invited paper

Atomic mixing phenomena and changes in faceted structure of Ge films grown on (100)Si by thermal annealing
N. Ohshima, Y. Koide, S. Zaima and Y. Yasuda 106
Effect of the growth temperature on the RHEED pattern of thin Ge layers on Si(001)-2 × 1 surface
C. Tatsuyama, T. Terasaki, H. Obata, T. Tanbo and H. Ueba 112
Control of composition and deposition rate in Si–Ge CVD epitaxy on Si
M. Kato, J. Murota and S. Ono 117
Comparative study of amorphous and crystalline buffer layers in MBE growth of GaAs on Si
W.Y. Uen, S. Sakawa and T. Nishinaga 122
Study of initial buffer layer in GaAs-on-Si growth
K. Kadoiwa, T. Nishimura, N. Hayafuji, M. Miyashita, H. Kizuki and K. Mizuguchi 128
Transmission electron microscopic study of AlAs/Si heterostructures grown by atomic layer epitaxy
O. Ueda, K. Kitahara, N. Ohtsuka, A. Hobbs and M. Ozeki 133
Raman scattering study on the first step growth of GaAs on Si grown by MOCVD
H. Katahama, Y. Matsuda, Y. Shiba and K. Fujita 141
Faceting of LPE GaAs grown on a misoriented Si(100) substrate
S. Sakawa and T. Nishinaga 145
Antiphase-domain-free InP on Si(001): optimization of MOCVD process
M. Grundmann, A. Krost and D. Bimberg 150
Effect of InGaAs/InP strained layer superlattice in InP-on-Si
H. Itakura, T. Suzuki, Z.K. Jiang, T. Soga, T. Jimbo and M. Umeno 154
Growth mechanism of GaP on Si substrate by MOVPE
T. Suzuki, T. Soga, T. Jimbo and M. Umeno 158
Formation of InAs microstructures on variously oriented GaAs substrates
J. Lee, K. Kudo, S. Kuniyoshi, K. Tanaka, Y. Makita and A. Yamada 164
Strain energy and critical thickness of heteroepitaxial InGaAs layers on GaAs substrate
M. Tabuchi, S. Noda and A. Sasaki 169
Reduction of dislocations in InGaAs layer on GaAs using epitaxial lateral overgrowth
K. Kato, T. Kusunoki, C. Takenaka, T. Tanahashi and K. Nakajima 174
Solid phase epitaxial growth of InP on GaAs
H. Maruyama, K. Pak, K. Sakakibara, M. Nakamura, Y. Takano and H. Yonezu 180

SECTION V. MONTE CARLO SIMULATION

Monte Carlo simulation of epitaxial growth in MBE and ALE mode *
W.M. Plotz, K. Hingerl and H. Sitter 186
Dynamical Monte Carlo simulation of $L1_1$(CuPt)-type ordering during (001) epitaxial growth of III–V semiconductor alloys
S. Matsumura, K. Takano, N. Kuwano and K. Oki 194
Twin lamella mechanism of fcc crystal growth: the Monte Carlo simulation approach
Nai-Ben Ming and Hua Li 199

SECTION VI. MOVPE, MOMBE, AND NEW MO SOURCES

The radial flow planetary reactor: low pressure versus atmospheric pressure MOVPE *
P.M. Frijlink, J.L. Nicolas, H.P.M.M. Ambrosius, R.W.M. Linders, C. Waucquez and J.M. Marchal 203
Thermodynamic analysis of GaAs growth by cold-wall metalorganic-chloride vapor phase epitaxy
H. Ikeda, K. Saitoh, Y. Hasegawa, A. Koukitu and H. Seki 211
MOVPE growth of GaAs using metallic arsenic and trimethylgallium
J. Kawai, H. Ito and K. Hara 216
Effect of precracking of organometallics and arsine on growth of GaAs
M. Sato, N. Kobayashi and Y. Horikoshi 221
Large difference in the decomposition rate of metalorganics between on As- and Ga-saturated GaAs (111)B surfaces
Y. Ohki, Y. Hiratani and M. Sasaki 226
Highly-uniform large-area MOVPE growth of InGaAsP by controlled stagnation point flow
M. Kondo, J. Okazaki, H. Sekiguchi, T. Tanahashi, S. Yamazaki and K. Nakajima 231
MOMBE growth of AlGaSb
Y. Okuno, H. Asahi, T. Kaneko, Y. Itani, K. Asami and S. Gonda 236

New organometallic sources for MOMBE/laser-assisted MOMBE
H. Sato, T. Yamada and H. Sugiura 241
Group III hydride precursors for the metalorganic vapour phase epitaxy (MOVPE) of (AlGa)As/GaAs heterostructures
H. Protzmann, T. Marschner, O. Zsebök, W. Stolz, E.O. Göbel, R. Dorn and J. Lorberth 248
Characterization of InP grown by low-pressure MOVPE using ethyldimethylindium and tertiarybutylphosphine
M. Ogasawara, H. Kamada and Y. Imamura 254
Reduction of carbon contamination in triethylphosphorus OMVPE GaP layers by Pt/Al_2O_3 catalyst
X.L. Wang, A. Wakahara, H. Kuwahara, S. Noda and A. Sasaki 261

SECTION VII. PHOTO-ASSISTED EPITAXY AND GROWTH

MOMBE growth of P-based III–V semiconductors and its photo-enhancement at low temperatures
M. Yoshimoto, K. Ozasa, T. Tsuji, A. Kajimoto and H. Matsunami 265
Investigation of photo-induced surface reactions by mass analysis in OMVPE of II–VI semiconductors
Sz. Fujita, S. Hirata and Sg. Fujita 269
Ar ion laser irradiation effects on the MOVPE growth of ZnSe using dimethyl zinc and hydrogen selenide as reactants
A. Yoshikawa and T. Okamoto 274
Study on the behavior of surface adatoms during photoassisted MBE of ZnSe and improvement of surface morphology
N. Matsumura, K. Senga, J. Kakuta, T. Fukada and J. Saraie 279
Effect of Ar laser-illumination upon ZnTe growth in atmospheric-pressure MOVPE
M. Nishio, H. Ogawa and A. Yoshida 284
Photo-MOCVD of $PbTiO_3$ thin films
T. Katayama, M. Fujimoto, M. Shimizu and T. Shiosaki 289

SECTION VIII. LIQUID-PHASE EPITAXY AND PLASMA-ASSISTED EPITAXY

Ga–As–Bi phase equilibrium study by LPE for thin solutions
Z. Helak, R. Korbutowicz, M. Panek, R. Paszkiewicz and M. Tlaczała 294
Uniform growth of Te-doped $Al_xGa_{1-x}As$ ($x = 0$–0.65) on (111)B GaP substrates by liquid phase epitaxy
K. Tomita, F. Kitagawa, H. Kano and M. Hashimoto 299
Growth of InGaP epitaxial layers by liquid phase electro-epitaxy
M. Yanagase, S. Tanaka, K. Hiramatsu and I. Akasaki 304
Plasma-assisted epitaxy on InAs layers on GaAs
H. Takei, T. Hamada and T. Hariu 309
Effects of discharge current and substrate temperature on the microstructure of diamond films deposited by DC plasma CVD
S. Nakao, H. Watatani, S. Maruno and M. Noda 313

SECTION IX. ARTIFICIALLY STRUCTURED SEMICONDUCTORS

Direct synthesis of semiconductor quantum wires by molecular-beam epitaxy on (311) surfaces
R. Nötzel, L. Däweritz and K. Ploog 318
InAs/InP short-period strained-layer superlattices grown by atomic layer epitaxy
Y. Sakuma, M. Ozeki, K. Kodama and N. Ohtsuka 324
Growth of $(GaAs)_{1-x}(Si_2)_x$ metastable alloys using migration-enhanced epitaxy
T. Sudersena Rao and Y. Horikoshi 328
Study of high-quality ZnSe/GaAs/ZnSe single quantum well and ZnSe/GaAs heterostructures
S. Ramesh, N. Kobayashi and Y. Horikoshi 333

SECTION X. IN-SITU OBSERVATION, GROWTH PROCESSES, AND ATOMICAL MICROSTRUCTURES

Dynamics and kinetics of MBE growth *
B.A. Joyce, J. Zhang, T. Shirata and J.H. Neave 338

In situ measurement method of GaAs surface coverage using secondary electron intensity
K. Kanisawa, J. Osaka, S. Hirono and N. Inoue 348
In-situ optical monitoring of pyrolysis process on substrate surface in GaAs MOCVD
N. Kobayashi, Y. Yamauchi and Y. Horikoshi 353
UHV–REM study of homoepitaxial growth of Si
M. Shima, Y. Tanishiro, K. Kobayashi and K. Yagi 359
In-situ RHEED study of growth processes in the initial stage of SiGe alloy film deposition by gas source molecular beam epitaxy
Y. Koide, A. Furukawa, S. Zaima and Y. Yasuda 365
Investigation of InP surface under arsenic pressure using RHEED–TRAXS
A. Watanabe, T. Isu, M. Hata and Y. Katayama 371
TEM investigation of CuAu-I type ordered structures in MBE-grown InGaAs crystals on (110) InP substrates
O. Ueda, Y. Nakata, T. Nakamura and T. Fujii 375
Cross-sectional TEM study of microstructures in MOVPE GaN films grown on α-Al_2O_3 with a buffer layer of AlN
N. Kuwano, T. Shiraishi, A. Koga, K. Oki, K. Hiramatsu, H. Amano, K. Itoh and I. Akasaki 381
Molecular imaging of epitaxially grown organic double-layer
S. Isoda, I. Kubo, A. Hoshino, N. Asaka, H. Kurata and T. Kobayashi 388

SECTION XI. STEP, SURFACE, AND INTERFACE

Direct observation of monoatomic step behaviour in MBE on Si by reflection electron microscopy *
A.L. Aseev, A.V. Latyshev and A.B. Krasilnikov 393
The role of step kinetics in MBE of compound semiconductors *
T. Nishinaga and T. Suzuki 398
Step-density dependence of growth rate on vicinal surface of MOCVD
M. Kasu, H. Saito and T. Fukui 406
Adsorption structure of K on Si(001) at various coverages
T. Urano, K. Sakaue, K. Nagano, S. Hongo and T. Kanaji 411
Nucleation mechanisms for compound semiconductors grown on Si by MOCVD
T. Soga, T. George, T. Jimbo and M. Umeno 418
Surface diffusion length during MBE and MOMBE measured from distribution of growth rates
T. Isu, M. Hata, Y. Morishita, Y. Nomura and Y. Katayama 423
Influence of surface diffusion on the structure of growing crystal surface
Y. Arima and T. Irisawa 428
Interdiffusion process in InGaAs/InP quantum well structures
K. Mukai, M. Sugawara and S. Yamazaki 433

SECTION XII. IMPURITY DOPING AND DEFECTS

Low-temperature epitaxial growth of in-situ doped silicon films
R. Kircher, M. Furuno, J. Murota and S. Ono 439
Delta-doped GaAs grown by chloride CVD
T. Imaizumi, M. Seiwa and O. Oda 443
Effective Si planar doping of GaAs by MOVPE using tertiarybutylarsine
T. Kikkawa, T. Ohori, H. Tanaka, K. Kasai and J. Komeno 448
Magnesium doping using an adduct of trimethylaluminum and dimethylmagnesium in metalorganic chemical vapor deposition
A. Hatano, T. Izumiya and Y. Ohba 455
Extremely high Be doping of InGaAs by low-temperature atomic layer epitaxy
N. Ohtsuka, K. Kodama, M. Ozeki and Y. Sakuma 460
Gas-source MBE growth of n-type InP using TEI, PH_3, and Si_2H_6
H. Ando, N. Okamoto, A. Sandhu and T. Fujii 464
Growth of GaP by MOVPE at very low pressure: kinetics and carbon incorporation
M. Weyers and M. Sato 469
Se and Te doping in LP-MOCVD-grown GaSb using H_2Se and DETe
F. Nakamura, K. Taira, K. Funato and H. Kawai 474

Calculation of native defect concentrations in GaAs grown by organometallic vapor-phase epitaxy
M. Ichimura and T. Wada 479
Photoluminescence of deep levels induced by sup-ppm H_2O in AlGaAs grown by MOVPE
K. Matsumoto and K. Uchida 484

SECTION XIII. ELECTRICAL AND OPTICAL PROPERTIES

Optical and luminescence properties of disordered superlattices *
A. Sasaki 490
Electrical characterization of Si-donor-related shallow and deep states in InGaAlP alloys grown by metalorganic chemical vapor deposition
M. Suzuki, M. Ishikawa, K. Itaya, Y. Nishikawa, G. Hatakoshi, Y. Kokubun, J. Nishizawa and Y. Oyama 498
Two-dimensional electron gas mobility in InGaAs/N-InAlAs heterostructures with ordered InGaAs grown on (110)-oriented InP substrates by molecular beam epitaxy
Y. Nakata, O. Ueda and T. Fujii 504
High electron mobility pseudomorphic $In_{0.52}Al_{0.48}As/In_{0.8}Ga_{0.2}As$ heterostructure on InP grown by flux-stabilized MBE
Y. Sugiyama, Y. Takeuchi and M. Tacano 509
Optical reflectance spectra of amorphous random multilayers and the classical localization of light
S. Nitta, K. Ogawa, T. Furukawa, T. Itoh and S. Nonomura 515
Photoluminescence of GaAs layers hybrid-grown on Si by MBE and LPE
Y. Yazawa, T. Minemura and T. Unno 519
MOCVD-grown SQWs on Si with AlGaAs/AlGaP intermediate layers and/or thermal cycle annealing: application to room-temperature CW lasers
T. Egawa, Y. Hayashi, T. Jimbo and M. Umeno 524
Study on radiative efficiency in AlGaInP/GaInP double-heterostructures: influence of deep level in cladding layers
K. Domen, K. Sugiura, C. Anayama, M. Kondo, M. Suguwara, T. Tanahashi and K. Nakajima 529
Improvement of photoluminescence characteristics of AlGaInP double hetero-structures grown by OMVPE
I. Yoshida, T. Katsuyama and H. Hayashi 533
Exciton-absorption transitions in $(GaP)_n(GaAs)_n$/GaAs atomic/layer superlattices
T. Takanohashi and M. Ozeki 538

SECTION XIV. SILICON EPITAXIAL GROWTH

Vapour growth of silicon: growth anisotropy and adsorption *
J.G.E. Gardeniers and L.J. Giling 542
Reaction of Si_2H_6 molecule on a silicon surface
Y. Ohshita, F. Uesugi and I. Nishiyama 551
Epitaxial growth mechanism at S_B steps of Si(001) surfaces by photo-induced Si(^{1}D) atoms
M. Tsuda, S. Oikawa and S. Furukawa 556
Epitaxial lateral overgrowth of Si on non-planar substrate
S. Kinoshita, Y. Suzuki and T. Nishinaga 561
Critical thickness for growth of epitaxial grains in silicon film deposited on superlattice surface of silicon (111)
K. Maki, Y. Shigeta and T. Kuroda 567

SECTION XV. SILICIDE AND METAL RELATED

Growth of single-crystalline $CoSi_2$ on (111)Si at low annealing temperatures by a nonultrahigh vacuum method
H.C. Cheng and M.H. Juang 572
Formation and epitaxial growth of titanium-disilicide on Si(111)
C.-K. Choi, H.-H. Park, J.Y. Lee, K.-I. Cho, M.-C. Paek, O.-J. Kwon, K.-H. Kim and S.-J. Yang 579
Formation of TiN by nitridation of magnetron sputtered Ti films using microwave plasma CVD
J. Moon, T. Ito, J.S. Ma and A. Hiraki 589
Interface structures of Pt/Au(001) epitaxial bilayer films prepared by means of ion beam sputtering
A. Sugawara and O. Nittono 596

Growth of small particles of iron–cobalt alloys prepared by gas-evaporation technique
T. Ohno 602

SECTION XVI. SiC AND AlGaN GROWTHS

Growth mechanism of 3C-SiC layers at a low temperature region in low-pressure CVD
Y. Hattori, T. Suzuki, T. Murata, T. Yabumi, K. Yasuda and M. Saji 607
Suppression of etch pit and hillock formation on carbonization of Si substrate and low temperature growth of SiC
H. Nagasawa and Y. Yamaguchi 612
Effect of acceptor impurity addition in low temperature growth of 3C-SiC
K. Takahashi, S. Nishino and J. Saraie 617
Effect of the junction interface properties on blue emission of SiC blue LEDs grown by step-controlled CVD
A. Suzuki, Y. Fujii, H. Saito, Y. Saito, Y. Tajima, K. Furukawa and S. Nakajima 623
Growth mechanism of GaN grown on sapphire with AlN buffer layer by MOVPE
K. Hiramatsu, S. Itoh, H. Amano, I. Akasaki, N. Kuwano, T. Shiraishi and K. Oki 628
Growth of single crystalline GaN film on Si substrate using 3C-SiC as an intermediate layer
T. Takeuchi, H. Amano, K. Hiramatsu, N. Sawaki and I. Akasaki 634
Doping of GaN with Si and properties of blue m/i/n/n^+ GaN LED with Si-doped n^+-layer by MOVPE
N. Koide, H. Kato, M. Sassa, S. Yamasaki, K. Manabe, M. Hashimoto, H. Amano, K. Hiramatsu and I. Akasaki 639
Epitaxial growth of AlN film by low-pressure MOCVD in gas-beam-flow reactor
S. Kaneko, M. Tanaka, K. Masu, K. Tsubouchi and N. Mikoshiba 643
Growth of Si-doped $Al_xGa_{1-x}N$ on (0001) sapphire substrate by metalorganic vapor phase epitaxy
H. Murakami, T. Asahi, H. Amano, K. Hiramatsu, N. Sawaki and I. Akasaki 648

SECTION XVII. II–VI SEMICONDUCTORS

Properties of II–VI/III–V heterovalent interfaces *
R.L. Gunshor, M. Kobayashi, N. Otsuka and A.V. Nurmikko 652
Effect of enhanced reactivity in plasma-assisted epitaxial growth of ZnSe
S. Yamauchi, T. Hariu and S. Ono 660
Growth of II–VI semiconductor quantum well structures under in situ RHEED observations
Y.-H. Wu, K. Ichino, Y. Kawakami, Sz. Fujita and Sg. Fujita 664
ZnSe/ZnS strained layer superlattices grown on CaF_2 substrates by MOVPE
T. Yokogawa and T. Narusawa 670
Interface characterization of heteroepitaxial ZnSe layers on GaAs substrates by cathodoluminescence
T. Matsumoto, T. Kato and E. Ishihara 674
PL and SIMS of vapor phase epitaxial ZnSe films
T. Muranoi 679
Oxide interfacial layer in Au ohmic contacts to p-type ZnSe
K. Akimoto, T. Miyajima, H. Okuyama and Y. Mori 683
Hetero-epitaxial growth of $Pb_{1-x}Cd_xS_{1-y}Se_y$ thin film by the hot-wall method
K. Mochizuki, H. Iwata, M. Isshiki and K. Masumoto 687
Observation of different reflected high-energy electron diffraction patterns during atomic layer epitaxy growth of CdTe epilayers
W. Faschinger, P. Juza and H. Sitter 692
Kinetic and interface studies for MOCVD CdTe and HgCdTe epilayers grown on GaAs substrates
Peng Rui-wu, Xu Fei and Ding Yong-qing 698
Homo-epitaxial growth of CdTe by sublimation under low pressure
Y. Yoshioka, H. Yoda and M. Kasuga 705
Vapor phase epitaxy of CdTe on sapphire and GaAs
M. Kasuga, H. Futami and Y. Iba 711
Tilt growth of CdTe epilayers on sapphire substrates by MOCVD
H. Ebe, A. Sawada, K. Maruyama, Y. Nishijima, K. Shinohara and H. Takigawa 718

SECTION XVIII. BULK CRYSTAL GROWTH

Growth of ternary $In_{0.14}Ga_{0.86}As$ bulk crystal with uniform composition at constant temperature through GaAs supply
T. Kusunoki, C. Takenaka and K. Nakajima 723
Interface instability in the growth of $Ga_{1-x}In_xAs_ySb_{1-y}$ and thermodynamic considerations
T. Ozawa, Y. Hayakawa and M. Kumagawa 728
Bulk cyrstal growth of 6H-SiC on polytype-controlled substrates through vapor phase and characterization
W.S. Yoo, A. Yamashita, T. Kimoto and H. Matsunami 733
Characterization of I–III–VI_2 bulk crystals grown by chemical vapor deposition: application of phase-shift-difference spectroscopy
K. Sato, Y. Kudo, S. Kijima and L.K. Samanta 740

SECTION XIX. HIGH T_c SUPERCONDUCTING FILMS

Growth mechanism and superconducting properties of ultrathin $YBa_2Cu_3O_{7-x}$ films *
T. Terashima, K. Shimura, T. Satoh, Y. Bando, Y. Matsuda, A. Fujiyama, S. Komiyama, K. Kamigaki and H. Terauchi 745
Epitaxial growth of CuO thin films by in situ oxidation of Cu thin films
R. Kita, T. Hase, M. Sasaki, T. Morishita and S. Tanaka 752
In-situ growth of Bi–Sr–Ca–Cu oxide superconducting thin films by molecular beam epitaxy with a pure ozone source
Y. Kasai and S. Sakai 758
Preparation of $Bi_2Sr_2Ca_{n-1}Cu_nO_{2n+4}$ (n = 1, 2, 3 and 4) thin films by MOCVD
J. Ishiai, S. Yamada, S. Yoshizawa and K. Endo 762
Thin film growth of Bi(Pb)–Sr–Ca–Cu–O on piezoelectric $PbTiO_3$ films
M. Akinaga and H. Fukuda 765
The crystallization and growth of the high-T_c phase in Bi–Sr–Ca–Cu–O thin films
S. Nagai, N. Fujimura, T. Ito and K. Shiraishi 769
Study of the microstructure of CVD-grown Bi–Sr–Ca–Cu–O thin films on (001) MgO substrates by high-resolution transmission electron microscopy
O. Ueda, T. Kimura, H. Yamawaki and M. Ihara 774
Preparation of $YBa_2Cu_3O_8$ thin films by MOCVD
H. Hayashi, Y. Yamada, D.J. Baar, T. Sugimoto, K. Sugawara, Y. Shiohara and S. Tanaka 782
Epitaxial growth of a-axis oriented laser deposited $YBa_2Cu_3O_{7-x}$ thin films
T. Hase, H. Takahashi, H. Izumi, K. Ohata, K. Suzuki, T. Morishita and S. Tanaka 788

SECTION XX. II–V, III–VI, AND CHALCOPYRITE CRYSTALS

Zn_3P_2 epitaxial growth by MOCVD
K. Kakishita, S. Ikeda and T. Suda 793
Growth and characterization of Ga_2Se_3 by molecular beam epitaxy
N. Teraguchi, M. Konagai, F. Kato and K. Tekahashi 798
Growth of $AgGaS_2$ single crystals by chemical transport with halogen
Y. Noda, T. Kurasawa, Y. Furukawa and K. Masumoto 802
Growth of $CuGaS_2$ by alternating-source-feeding MOVPE
H. Otoma, T. Honda, K. Hara, J. Yoshino and H. Kukimoto 807
Growth and characterization of Cu–Al–Se system by MBE
Y. Morita and T. Narusawa 811

SECTION XXI. OXIDE AND ORGANIC THIN FILMS

Heteroepitaxy of zinc oxide thin films, considering non-epitaxial preferential orientation
S. Goto, N. Fujimura, T. Nishihara and T. Ito 816
Heteroepitaxy of $LiNbO_3$ and $LiNb_3O_8$ thin films on C-cut sapphire
N. Fujimura, T. Ito and M. Kakinoki 821

Epitaxial growth of organic crystals on organic substrates – polynuclear aromatic hydrocarbons
A. Hoshino, S. Isoda and T. Kobayashi 826
Thin film growth characteristics of charge transfer complexes
T. Nakayama, A. Miura and M. Azuma 831

Author index 836
Subject index 846